Amendments to the Claims:

Please replace all prior versions, and listings of claims in the application with the following listing of claims.

Listing of claims

Claims 1-9 (canceled)

Claim 10 (previously presented): A transceiver for processing code division multiple access signals received through at least one multipath propagation channel to produce at least one relative frequency error estimate, comprising:

a processor for receiving and processing the signals using a local frequency reference oscillator to obtain representative complex numerical samples for processing;

channel estimators for correlating the complex numerical samples with shifts of a locally generated despreading code and producing a number of complex channel estimates, each corresponding to a different delayed ray of the at least one multipath propagation channel;

frequency error estimators for computing a frequency error estimate for each ray based on successive values of a respective one of the channel estimates; and

at least one summer for performing a weighted summation of the frequency error estimates to provide at least one relative frequency error estimate,

wherein the relative frequency error estimate is used to control the frequency of a local frequency reference oscillator,

and further comprising:

a rake combiner for despreading a desired signal using shifts of a locally generated wanted signal despreading code to produce one complex sample per data symbol per shift and for performing a weighted summation of the complex samples per shift using weighting factors based on the channel estimates to produce a rake-combined value for each data symbol;

a decoder for decoding the per-symbol rake-combined values using a soft error correction decoder to reproduce wanted information bits; and

an error detection decoder for performing an error check on the decoded information bits and to generate an error or no-error indication, wherein the relative frequency error estimate is only used to control the local reference oscillator when a no-error indication is generated.

Claim 11 (original): The transceiver of claim 10, wherein the local frequency reference is used to control a transmit frequency.

Claims 12-14 (canceled)

Claim 15 (previously presented): A transceiver for processing code division multiple access signals received through at least two multipath propagation channels to produce at least two combined frequency error estimates, comprising:

a processor for receiving and processing the signals using a local frequency reference oscillator to obtain representative complex numerical samples for processing;

channel estimators for correlating the complex numerical samples with shifts of a locally generated despreading code and producing a number of complex channel estimates, each corresponding to a different delayed ray of the at least two multipath propagation channels;

frequency error estimators for computing a frequency error estimate for each ray based on successive values of a respective one of the channel estimates; and

at least two summers for performing weighted summations of groups of the frequency error estimates to provide at least two combined frequency error estimates,

wherein:

each of the combined frequency error estimates corresponds to a respectively different one of at least two base station transmitters.

Claims 16-24 (canceled)

Claim 25 (previously presented): A method for processing code division multiple access signals received through at least one multipath propagation channel to produce at least one relative frequency error estimate, comprising the steps of:

receiving and processing the signals using the local frequency reference oscillator to obtain representative complex numerical samples for processing;

correlating the complex numerical samples with shifts of a locally generated despreading code and producing a number of complex channel estimates, each corresponding to a different delayed ray of the at least one multipath propagation channel;

computing a frequency error estimate for each ray based on successive values of a respective one of the channel estimates;

performing at least one weighted summation of the frequency error estimates to provide at least one relative frequency error estimate;

using the at least one relative frequency error estimate to control the frequency of a local frequency reference oscillator;

despreading a desired signal with a rake combiner using shifts of a locally generated wanted signal despreading code to produce one complex sample per data symbol per shift and performing a weighted summation of the complex samples per shift using weighting factors based on the channel estimates to produce a rake-combined value for each data symbol;

decoding the per-symbol rake-combined values using a soft error correction decoder to reproduce wanted information bits; and

performing an error check on the decoded information bits and to generate an error or no-error indication, wherein the relative frequency error estimate is only used to control the local reference oscillator when a no-error indication is generated.

Claim 26 (original): The method of claim 25, wherein the local frequency reference oscillator is used to control the transceiver to transmit on a desired channel frequency.

Claims 27-29 (canceled)

Claim 30 (previously presented): A method for processing code division multiple access signals received through at least two multipath propagation channels to produce at least two combined frequency error estimates, comprising the steps of:

receiving and processing the signals using the local frequency reference oscillator to obtain representative complex numerical samples for processing;

correlating the complex numerical samples with shifts of a locally generated despreading code and producing a number of complex channel estimates, each corresponding to a different delayed ray of the at least two multipath propagation channels;

computing a frequency error estimate for each ray based on successive values of a respective one of the channel estimates; and

performing at least two weighted summations of groups of the frequency error estimates to provide at least two combined frequency error estimates,

wherein each of the combined frequency error estimates corresponds to a respectively different one of at least two base station transmitters.

Claim 31 (previously presented): A transceiver for processing code division multiple access signals received through at least one multipath propagation channel to produce at least one relative frequency error estimate, comprising:

a processor for receiving and processing the signals using the local frequency reference oscillator to obtain representative complex numerical samples for processing;

despreaders for different delayed rays of the multipath channel for correlating the numerical samples with different shifts of a locally generated despreading code over symbol intervals to produce streams of complex despread values corresponding to each ray and successive symbol interval;

frequency error correctors for correcting frequency errors on each of the despread value streams by, for each of the despread value streams, progressively rotating the phase angle of successive despread values at a rate given by an associated frequency error integral;

channel estimators for processing the frequency-corrected despread value streams to produce complex channel estimates for each ray;

frequency error estimators for determining a frequency error estimate for each ray by processing successive values of the channel estimates for the corresponding ray; and

at least one combiner for combining the associated frequency error integrals to produce at least one relative frequency error estimate.

Claim 32 (original): The transceiver of claim 31, wherein the at least one relative frequency error estimate is used to control the frequency of a local frequency reference.

Claim 33 (original): The transceiver of claim 32, further comprising inner loop integrators for integrating respective frequency error estimates to produce integrated frequency errors.

Claim 34 (previously presented): The transceiver of claim 33, wherein the at least one combiner adds the frequency error estimates and computes a relative frequency error estimate and integrates the frequency error estimates using an outer loop integrator to produce the control signal.

Claim 35 (original): The transceiver of claim 32, wherein the local frequency reference oscillator is used to control a transmit frequency.

Claim 36 (original): The transceiver of claim 32, further comprising a rake combiner for despreading a desired signal using shifts of a locally generated wanted signal despreading code to produce one complex sample per data symbol per shift and for performing a weighted summation of the complex samples per shift using weighting factors based on the channel estimates to produce a rake-combined value for each data symbol.

Claim 37 (original): The transceiver of claim 36, further comprising a decoder for decoding the per-symbol rake-combined values using a soft error correction decoder to reproduce wanted information bits.

Claim 38 (original): The transceiver of claim 37, further comprising an error detection decoder for performing an error check on the decoded information bits and to generate an error or no-error indication, wherein the relative frequency error estimate is only used to control the local reference oscillator when the no-error indication is generated.

Claim 39 (original): The transceiver of claim 31, wherein the signals are received from one base station.

Claim 40 (original): The transceiver of claim 31, wherein the combiners produce frequency error estimates separately for each base station.

Claim 41 (previously presented): A method for processing code division multiple access signals received through at least one multipath propagation channel to produce at least one relative frequency error estimate, comprising the steps of:

receiving and processing the signals using the local frequency reference oscillator to obtain representative complex numerical samples for processing;

correlating the numerical samples with different shifts of a locally generated despreading code over symbol intervals to produce streams of complex despread values corresponding to each ray and successive symbol interval;

correcting frequency errors on each of the despread value streams by, for each of the despread value streams, progressively rotating the phase angle of successive despread values at a rate given by an associated frequency error integral;

processing the frequency-corrected despread value streams to produce complex channel estimates for each ray;

determining a frequency error estimate for each ray by processing successive values of the channel estimates for the corresponding ray; and

combining the associated frequency error integrals to produce at least one relative frequency error estimate.

Claim 42 (original): The method of claim 41, further comprising using the at least one relative frequency error estimate to control the frequency of a local reference frequency oscillator.

Claim 43 (original): The method of claim 42, further comprising integrating respective frequency error estimates using inner loop integrators to produce integrated frequency errors.

Claim 44 (original): The method of claim 42, wherein the step of combining includes adding the frequency error estimates and obtaining a relative frequency error estimate and integrating the relative frequency error estimate using an outer loop integrator to produce the control signal.

Claim 45 (original): The method of claim 42, further comprising using the local frequency reference oscillator to control a transmit frequency.

Claim 46 (original): The method of claim 42, further comprising despreading a desired signal with a rake combiner using shifts of a locally generated wanted signal despreading code to produce one complex sample per data symbol per shift and performing a weighted summation of the complex samples per shift using weighting factors based on the channel estimates to produce a rake-combined value for each data symbol.

Claim 47 (original): The method of claim 46, further comprising decoding the per-symbol rake-combined values using a soft error correction decoder to reproduce wanted information bits.

Claim 48 (original): The method of claim 47, further comprising performing an error check on the decoded information bits and to generate an error or no-error indication, wherein the relative frequency estimate is only used to control the local reference oscillator when the no-error indication is generated.

Claim 49 (original): The method of claim 41, wherein the signals are received from one base station.

Claim 50 (original): The method of claim 41, wherein the frequency error estimates are determined separately for each base station.

Claim 51 (original): The transceiver of claim 32, further comprising:

an inner loop integrator for integrating the frequency error estimate to produce inner loop integral values; and

an outer loop integrator for integrating the inner loop integral values to produce a control signal to control the local frequency reference oscillator to a value based on the received signal.

Claim 52 (original): The transceiver of claim 36, further comprising an error correction and detection decoder for soft-decoding a block of the rake-combined values to provide an error indication for successively recurring block intervals.

Claim 53 (original): The transceiver of claim 52, wherein the outer loop integrator integrates the inner loop integral values only for blocks for which the error indication is indicative of no errors, and the inner loop integrator integrates the frequency error estimate only for blocks for which the error indication is indicative of no errors.

Claim 54 (original): The transceiver of claim 52, wherein the combiner processes frequency error estimates corresponding to blocks of symbols that have been error correction and detection decoded and which have an associated error indication indicative of no errors.

Claim 55 (original): The method of claim 42, further comprising:

integrating the frequency error estimates using an inner loop integrator to produce inner loop integral values; and

integrating the inner loop integral values using an outer loop integrator to produce a control signal to control the local frequency reference oscillator to a value based on the received signal.

Claim 56 (original): The method of claim 46, further comprising soft-decoding a block of the rake-combined values to provide an error indication for successively recurring block intervals.

Claim 57 (original): The method of claim 56, wherein the step of integrating comprises integrating inner loop integral values only for blocks for which the error indication is indicative of no errors, and the step of integrating using an inner loop integrator integrates the frequency error estimates only for blocks for which the error indication is indicative of no errors.

Claim 58 (original): The method of claim 56, wherein the step of combining processes frequency error estimates corresponding to blocks of symbols that have been error correction and detection decoded and which have an associated error indication indicative of no errors.

Claims 59-61 (canceled)

Claim 62 (previously presented): A transceiver for processing code division multiple access signals received through at least one multipath propagation channel to produce at least one relative frequency error estimate, comprising:

a processor for receiving and processing the signals using a local frequency reference oscillator to obtain representative complex numerical samples for processing;

channel estimators for correlating the complex numerical samples with shifts of a locally generated despreading code and producing a number of complex channel estimates, each corresponding to a different delayed ray of the at least one multipath propagation channel;

frequency error estimators for computing a frequency error estimate for each ray based on successive values of a respective one of the channel estimates; and

at least one summer for performing a weighted summation of the frequency error estimates to provide at least one relative frequency error estimate,

wherein the relative frequency error estimate is used to control the frequency of a local frequency reference oscillator, and

further comprising an outer loop integrator for integrating the frequency estimates to produce a control signal to control the local frequency reference oscillator to a value based on the received signal,

wherein the at least one summer adds the real parts of the per-ray frequency error estimates to obtain a real sum and adding the imaginary parts to produce an imaginary sum and computing the two-argument arctangent of the real and imaginary sum.

Claims 63-65 (canceled)

Claim 66 (previously presented): A method for processing code division multiple access signals received through at least one multipath propagation channel to produce at least one relative frequency error estimate, comprising the steps of:

receiving and processing the signals using the local frequency reference oscillator to obtain representative complex numerical samples for processing;

correlating the complex numerical samples with shifts of a locally generated despreading code and producing a number of complex channel estimates, each corresponding to a different delayed ray of the at least one multipath propagation channel;

computing a frequency error estimate for each ray based on successive values of a respective one of the channel estimates;

performing at least one weighted summation of the frequency error estimates to provide at least one relative frequency error estimate;

using the at least one relative frequency error estimate to control the frequency of a local frequency reference oscillator;

integrating the relative frequency error estimate using an outer loop integrator to produce a control signal; and

controlling the frequency of the local frequency reference oscillator using the control signal,

wherein the step of performing at least one weighted summation includes adding the real parts of the per-ray frequency error estimates to obtain a real sum and adding the imaginary parts to produce an imaginary sum and computing the two-argument arctangent of the real and imaginary sum.

Claim 67 (original): The transceiver of claim 36, further comprising a rake-combiner for rake-combining and decoding the despread values to decode unknown data symbols.

Claim 68 (original): The transceiver of claim 67, wherein the rake-combiner comprises error correction and error detection decoder to produce an associated error indication for the decoded symbols.

Claim 69 (original): The transceiver of claim 31, wherein the combiner adds the real parts of the per-ray frequency error estimates to obtain a real sum and adding the imaginary parts to produce an imaginary sum and computing the two-argument arctangent of the real and imaginary sum.

Claim 70 (original): The method of claim 41, further comprising rake-combining and decoding the despread values to decode unknown data symbols.

Claim 71 (original): The method of claim 70, wherein the decoding comprises error correction and error detection decoding to produce an associated error indication for the decoded symbols.

Claim 72 (original): The method of claim 41, wherein the combining step includes adding the real parts of the per-ray frequency error estimates to obtain a real sum and adding the imaginary parts to produce an imaginary sum and computing the two-argument arctangent of the real and imaginary sum.

Claim 73 (currently amended): An apparatus for estimating at least two frequency errors between a local frequency reference of a receiver and carrier frequencies of two or more transmitters, comprising:

frequency error estimators for estimating frequency errors separately for different signal paths; and

combiners for combining groups of the frequency error estimates to produce at least two combined frequency error estimates,

wherein:

each of the combined frequency error estimates corresponds to a respectively different one of the two or more transmitters.

Claim 74 (original): The apparatus of claim 73, further comprising integrating the combined frequency error estimates.

Claim 75 (currently amended): A method for estimating at least two frequency errors between a local frequency reference of a receiver and carrier frequencies of two or more transmitters, comprising the steps of:

estimating frequency errors separately for different signal paths; and

combining groups of the frequency error estimates to produce at least two combined frequency error estimates,

wherein each of the combined frequency error estimates corresponds to a respectively different one of the two or more transmitters.

Claim 76 (original): The method of claim 75, further comprising integrating the combined frequency error estimates.

Claim 77 (previously presented): The transceiver of claim 15, wherein at least one of the base station relative frequency error estimates is formed using two or more fingers of a RAKE receiver.

Claim 78 (previously presented): The method of claim 30, wherein at least one of the base station frequency error estimates is formed using two or more fingers of a RAKE receiver.

Claim 79 (previously presented): The apparatus of claim 73, wherein at least one of the transmitters frequency error estimates is formed using two or more fingers of a RAKE receiver.

Claim 80 (previously presented): The transceiver of claim 75, wherein at least one of the transmitter frequency error estimates is formed using two or more fingers of a RAKE receiver.

Claim 81 (previously presented): The transceiver of claim 15, comprising:

a combiner for combining the at least two combined frequency error estimates to provide a relative frequency error estimate, wherein the relative frequency error estimate is used to control the frequency of a local frequency reference oscillator.

Claim 82 (previously presented): The transceiver of claim 15, wherein the at least two combined frequency error estimates are used to correct frequency error in groups of rays.